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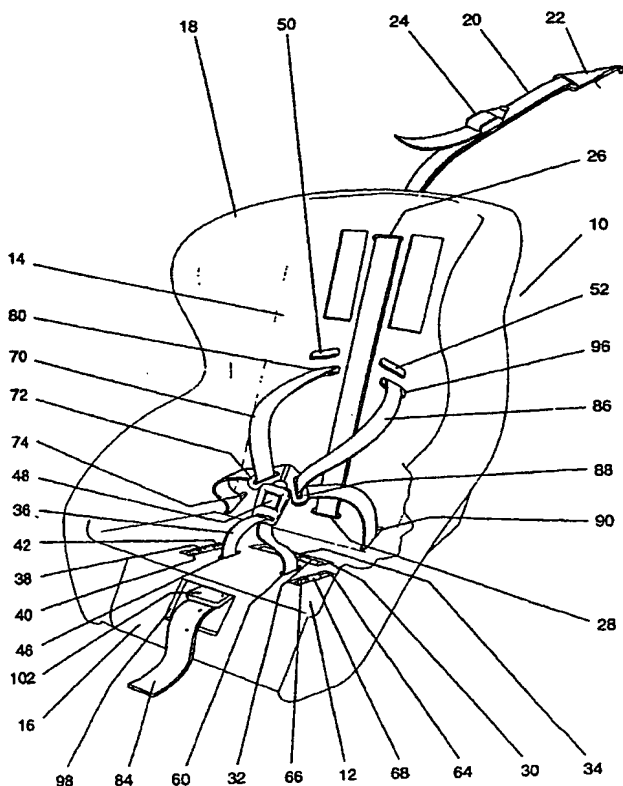
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[Continued on next page]

(54) Title: **IMPROVED CHILD RESTRAINTS**



(57) Abstract: A child restraint having a shell (10) and at least one harness assembly the restraint being selectively reconfigurable between a type B restraint and a type E restraint. A type B restraint is a forward facing chair with a harness and is used generally with child seated. A booster seat with a child harness is referred to as a type E restraint. The harness assembly includes two hip and shoulder straps (70, 86) which pass through at least one elongate opening in the restraint and combine to form a tether strap (20) for attachment to a vehicle anchor point. The shell includes a base (12) and a back (14). The back (14) has at least one, preferably a pair of upper vertically elongate openings, for shoulder straps (70, 86) of the harness assembly to pass through when the restraint is in type E configuration.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

IMPROVED CHILD RESTRAINTS

Field of the Invention

This invention relates to an improved child restraint wherein the one restraint shell can be used with different harness configurations to make it useable
5 for children of different sizes.

Background to the Invention

Child restraints have been in use in automobiles for many years as they have a strong record of saving the life of the child therein when the automobile is involved in a collision. Developments over their period of use has made them even
10 more safe.

Type A restraints are rearward facing restraints with a harness, intended to be used with the child semi-reclined. They are intended to be used for children up to 9 kg in weight - about 6 months of age, on average. Type B restraints are a forward facing chair with a harness, and are intended to be used with the child
15 seated. These are intended to be used for children up to 18 kg in weight - about 4 years of age. Some type B restraints incorporate a recline mechanism to enable the restraint to recline so as to assist the child when sleeping.

Convertible restraints incorporate both type A and type B functions.

Type C restraints are intended to be used in a forward-facing position. The
20 type C restraint is a harness used without a chair or safety seat and is suitable for children in the range 14kg to 32kg in weight.

Booster seats or booster cushions are used for children in the weight range of 14kg to 26kg - up to about 8 years of age. They raise the child to a more convenient height, and can be used with a vehicle seat belt or lap/sash belt, and a
25 type C child harness. The child harness is preferred as a child may "submarine" - slide under the vehicle lap/sash belt - in the event of a major collision. Booster

seats with a child harness are referred to as a type E restraint.

Summary of the Invention

In accordance with the invention it has been appreciated that it would be convenient to have a child restraint that is readily convertible between type B and type E configurations, so as to make the restraint useable for children of different sizes.

The present invention accordingly provides a child restraint having a shell and at least one harness assembly, the shell and harness assembly being selectively reconfigurable between a type B restraint (as herein defined) and a type E restraint (as herein defined).

Advantageously, the restraint is also selectively reconfigurable to a type A restraint (as herein defined).

Preferably, the shell has a base and a back, the back having at least one vertically elongate opening, for the passage therethrough of shoulder strap means of the at least one harness assembly or another harness assembly when the restraint is configured in a type E configuration.

The back of the restraint preferably further includes a plurality of horizontally aligned pairs of openings for the passage therethrough of shoulder straps of the at least one harness assembly, when the restraint is configured in a type A or B configuration.

Advantageously, the harness assembly includes a tether strap releasably secured to the shell and being adapted to, in use, be connected to an anchor.

When providing for type E configuration, the restraint preferably further includes a harness assembly providing shoulder straps and a tether strap adapted to, in use, be connected to an anchor. The tether strap is also preferably connected to the retaining member.

Advantageously, the shoulder straps are connected to a retaining member adjacent the upper pair of openings. More preferably, the shoulder straps are integral with the tether strap.

Advantageously, the tether strap is adjustable in length.

5 The retaining member may be adjustable in position relative to the upper pair of openings by means of a tension strap. Preferably, the retaining member may be attached to the shell by means of at least one biasing means. More preferably, the at least one biasing means includes a spring or a plurality of springs, for example, bungy straps, springs or other suitable elasticised material.

10 The invention also provides a child restraint having a harness assembly, the harness assembly including two hip and shoulder straps which pass through at least one elongate opening in the restraint and combine to form a tether strap for attachment to a vehicle anchor point.

15 Preferably, there are two aligned elongate openings, one for each of the hip and shoulder straps.

More preferably, the two hip and shoulder straps form a loop through a vehicle anchor point connector.

Advantageously, at least one of the hip and shoulder straps includes an adjustment means for adjusting the effective length of the hip and shoulder strap.

20 More advantageously, the two hip and shoulder straps are integral.

The invention further provides a shell for a child restraint, the shell including a base and a back, the back having an upper pair of vertically elongate openings, for the passage therethrough of shoulder straps of a harness assembly when the restraint is in a type E configuration.

25 The shell preferably further includes a plurality of horizontally aligned pairs

of openings for the passage therethrough of shoulder straps of said harness assembly, when the restraint is in a type A or B configuration.

Brief Description of Drawings

In order that the invention may be readily understood there shall now be
5 described by way of non-limitative example only a preferred construction of a child restraint incorporating the principal features of the present invention, the description being with reference to the accompanying illustrative drawings in which:

Figure 1 is a perspective view of a restraint according to an embodiment of
10 the present invention with a first form of harness assembly, whereby the restraint is in a type B configuration;

Figure 2 is a front view of the embodiment of Figure 1;

Figure 3 is an underneath perspective view of the embodiment of Figures 1
and 2;

15 Figure 4 is a rear view of the embodiment of Figures 1 to 3;

Figure 5 is a front perspective view of the restraint assembly of Figures 1 to 4, but with a second form of harness assembly in a type E configuration;

Figure 6 is a front view of the embodiment of Figure 5; and

Figure 7 is a rear view of the embodiment of Figures 5 and 6.

20 Description of Preferred Embodiments

To first refer to Figures 1 to 4, there is shown a child restraint having a shell
10. The shell 10 is adapted to be covered by a suitable cover (not shown) with or without different inserts as required.

The shell 10 has a base 12, back 14, front panel 16 and side wings 18. A tether strap 20 is used to securely yet releasably connect the restraint to a vehicle anchor point (not shown). The tether strap 20 has a connector 22 to enable connection to the anchor point, and adjustment means 24 to adjust the effective
5 length of tether strap 20 to maintain the correct tension in strap 20. Tether strap 20 passes through an upper passage 26 and over the front surface of back 14. It also passes through a lower passage 28. To secure tether strap 20 to the shell 10, the base 12 has a cylindrical recess 30 therein with an opening through which the tether strap 20 can pass. The tether strap 20 terminates in a loop 34 which
10 engages over a rod 32 shaped to be a reasonably tight fit in recess 30. In this way, tether strap 20 is releasably yet securely connected to shell 10.

A crotch strap 36 is also provided. The crotch strap 36 has a first loop 38 at a first end thereof and which engages over a first rod 40, the first rod 40 being located in a first recess 42 in base 12. The first recess 42 has a first opening
15 through which the crotch strap 36 passes. A further first opening 46 enables strap 36 to pass above base 12. At the other end, the crotch strap 36 has a second loop 68 which engages over a second rod 66, the second rod 66 being located in a second recess 64 in base 12. The second recess 64 has a second opening through which the crotch strap passes. A further second opening 60 enables strap
20 36 to pass above base 12. Between first further opening 46 and second further opening 60, crotch strap 36 has a female buckle portion 48.

Adapted to engage with female buckle portion 48 are first male buckle portion 72 and second male buckle portion 88 slidably mounted on first hip and shoulder strap 70, and second hip and shoulder strap 86, respectively.

25 The first hip and shoulder strap 70 passes to the rear of back 14 through a first lower opening 74. At its end it has a first hip strap loop 78 which passes over first hip strap rod 76 so as to retain the first hip and shoulder strap 70 in position relative to shell 10. The first hip and shoulder strap 70 also passes through a first
30 of a pair of aligned, upper openings 80, to then be behind back 14. It then passes to the lower end of back 14, where it is secured to a retaining member 82. Lugs 75 on either side of opening 74 retain rod 76 in a secure yet releasable manner

relative to shell 10.

The second hip and shoulder strap 86 passes to the rear of back 14 through a second of the pair of aligned, upper openings 90. At its end it has a second hip strap loop 94 which passes over second hip strap rod 92 so as to
5 retain the second hip and shoulder strap 86 in position relative to shell 10. The second hip and shoulder strap 86 also passes through a second of a pair of aligned openings 96, to then be behind back 14, where it is secured to the retaining member 82. Lugs 91 on either side of opening 90 retain rod 92 in a secure yet releasable manner relative to shell 10.

10 Also secured to retaining member 82 is a tension strap 84 which has a length adjuster 102. The strap 84 passes through an opening 100 in a recess 98 in front panel 16. The recess 98 is to accommodate an adjustment means so that the effective length (ie. from front panel 16 to retaining member 82) can be joined. In this way the correct tension can be maintained in hip and shoulder straps 70,
15 86.

A second pair 50, 52 of aligned, upper openings are provided so that the upper point for hip and shoulder straps 70, 86 can be raised as the child grows. To move the straps 70, 86 requires the loops 78, 94 to be removed from their respective rods 76, 92 and the straps 70, 86 withdrawn through openings 74, 90;
20 buckles 72, 88; and openings 80, 96. The straps 70, 86 can then be passed through openings 74, 90; buckles 72, 88; and openings 74, 90. Upon passing of loops 78, 94 over rods 76, 92 the adjustment is complete.

As depicted in Figures 1 to 4, the child restraint is in a type B configuration, ie. a conventional forward facing chair with harness. The shell is arranged in a
25 manner well-known in the art to allow reorientation of the restraint for type A use, ie. rearward facing restraint with harness. For an older child, the restraint may be reconfigured for type E use by replacing the tether and shoulder straps with a tether and shoulder strap harness assembly 100 as illustrated in Figures 5 to 7.

For mounting this harness assembly 100, an upper pair 54, 56 of vertically

elongate, horizontally aligned, rectangular openings are provided in the back 14 of the shell 10, generally above the respective pairs of shoulder strap openings, 80, 96, and 50, 52. In this configuration, the retaining member 82' is in a higher position adjacent the openings, 54, 56. As best illustrated in Figure 7, the tension
5 strap 84' remains connected to the retaining member 82' as before, but its lower end is looped around a retaining rod 58 which is releasably yet securely attached to shell 10 in any conventional manner. For example, the ends of rod 58 may be releasably held in slots (not shown) provided in the rear of the shell 10.

Hip and shoulder straps 70', 86' of assembly 100 pass through openings
10 54, 56 and pass through slots 104', 106' in retaining member 82' and continue to form a loop through connector 22'. Referring particularly to Figure 7, it can be seen that hip and shoulder straps assembly 100 also provides the tether strap 20'. The adjustment means 24' is provided as before.

To maintain retaining member 82' in position relative to shell 10 and
15 openings 54, 56, two springs 108, 110 are provided. Springs 108, 110 are attached at one end to the retaining member 82' and at their opposite ends to an upper portion of the rear of the shell 10. In this way, tension strap 84' is kept under tension, and its adjusting means 102' can be adjusted to suit the shoulder height of the child. As this may raise retaining member 82' relative to shell 10
20 under influence of springs 108, 110, the adjustment means 24' may also require adjustment to maintain the correct tension in hip and shoulder straps 70', 86'.

In this way, the hip and shoulder straps 70', 86' are connected directly to the vehicle anchor point via connector 22', rather than to the shell 10 of restraint, as in the type B configuration. Therefore, at one end of the straps 70', 86' the
25 child is restrained directly, and supported by base 12.

It will be appreciated that with the child harnessed directly to the anchor point of the vehicle rather than to the shell 10, and with the shell 10 serving as a booster seat, the configuration is type E.

If desired, the slots 54, 56 and 50, 52 may be combined into enlarged

elongate slots. Furthermore, slots 80, 96 may be incorporated into such enlarged, elongate slots, if desired. This may be achieved by providing a cross-bar or other formation within the enlarged elongate slot so as to define the equivalent upper position of the hip and shoulder straps normally defined by openings 50, 52.

5 Also, if desired, approximately L-shaped projections may be located on the rear surface of back 14 on the outermost sides of slots 54,56 to retain therebetween in a slideable manner retaining member 82 so that movement of retaining member 82 relative to back 14 is in a plane parallel to back 14, and in the longitudinal (vertical) direction.

10 If desired, the present invention can be used whereby one harness could be used for all requirements of types A, B, C or E. Also, the one tether strap 20 could be used for all four categories.

15 It will be understood that the invention disclosed and defined in this specification extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations constitute various alternative aspects of the invention.

CLAIMS

1. A child restraint having a shell and at least one harness assembly, the restraint being selectively reconfigurable between a type B restraint (as herein defined) and a type E restraint (as herein defined).
- 5 2. A child restraint according to claim 1, wherein the restraint is also selectively reconfigurable to a type A restraint (as herein defined).
3. A child restraint according to claim 1 or 2, wherein the shell has a base and a back, the back having at least one, preferably a pair of, upper vertically elongate openings, for the passage therethrough of shoulder strap means of said at least
10 one harness assembly or another harness assembly when the restraint is configured in a type E configuration.
4. A child restraint according to claim 3, wherein the back further includes a plurality of horizontally aligned pairs of openings for the passage therethrough of shoulder straps of said at least one harness assembly, when the restraint is
15 configured in a type A or B configuration.
5. A child restraint according to any preceding claim, wherein the harness assembly includes a tether strap releasably secured to the shell and being adapted to, in use, be connected to an anchor.
6. A child restraint according to any preceding claim, wherein for providing
20 said type E configuration, the restraint includes a harness assembly providing shoulder straps and a tether strap adapted to, in use, be connected to an anchor.
7. A child restraint according to claim 6, wherein the tether strap is also connected to the retaining member.
8. A child restraint according to claim 6 or 7, wherein the shoulder straps are
25 integral with the tether strap.

9. A child restraint according to any one of claims 5 to 8, wherein the tether strap is adjustable in length.
10. A child restraint according to claim 3, wherein the shoulder straps are connected to a retaining member adjacent the upper pair of openings.
- 5 11. A child restraint according to claim 10, wherein the retaining member is adjustable in position by means of a tension strap.
12. A child restraint according to claim 10 or 11, wherein the retaining member is attached to the shell by means of at least one biasing means.
13. A child restraint according to claim 12, wherein the at least one biasing
10 means includes a plurality of springs.
14. A child restraint having a harness assembly, the harness assembly including two hip and shoulder straps which pass through at least one elongate opening in the restraint and combine to form a tether strap for attachment to a vehicle anchor point.
- 15 15. A child restraint according to claim 14, wherein there are two aligned elongate openings, one for each of the hip and shoulder straps.
16. A child restraint according to claim 14 or 15, wherein the two hip and shoulder straps form a loop through a vehicle anchor point connector.
17. A child restraint according to any one of claims 14 to 16, wherein at least
20 one of the hip and shoulder straps includes an adjustment means for adjusting the effective length of the hip and shoulder strap.
18. A child restraint according to any one of claims 14 to 17, wherein the two hip and shoulder straps are integral.
19. A shell for a child restraint, the shell including a base and a back, the back
25 having at least one, preferably a pair of, upper vertically elongate openings, for the

passage therethrough of shoulder straps of a harness assembly when the restraint is in a type E configuration.

20. A shell according to claim 19, further including a plurality of horizontally aligned pairs of openings for the passage therethrough of shoulder straps of said harness assembly, when the restraint is in a type A or B configuration.
- 5

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By its Registered Patent Attorneys
Freehills Carter Smith Beadle

6 November 2000

Figure 1

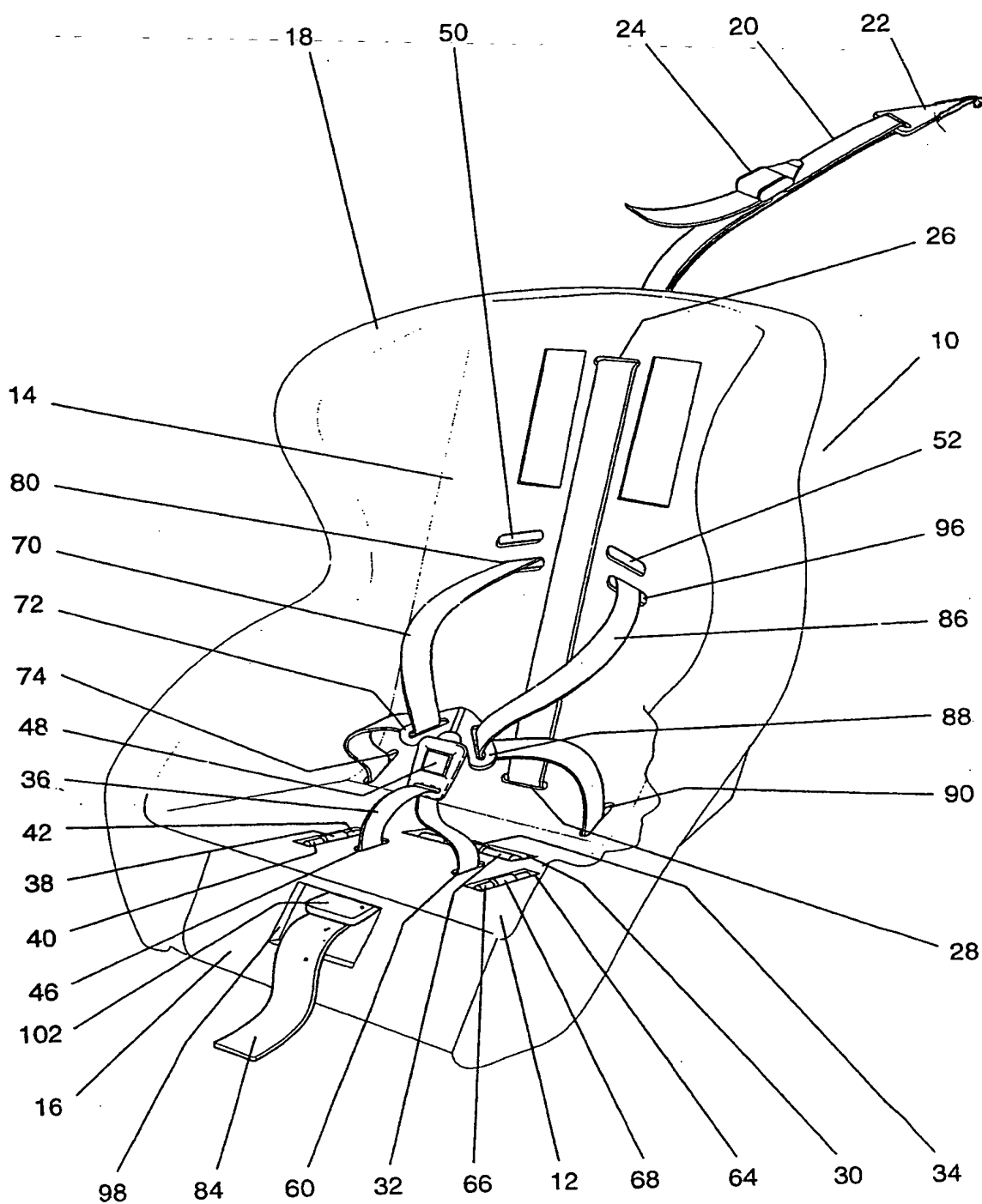


Figure 2

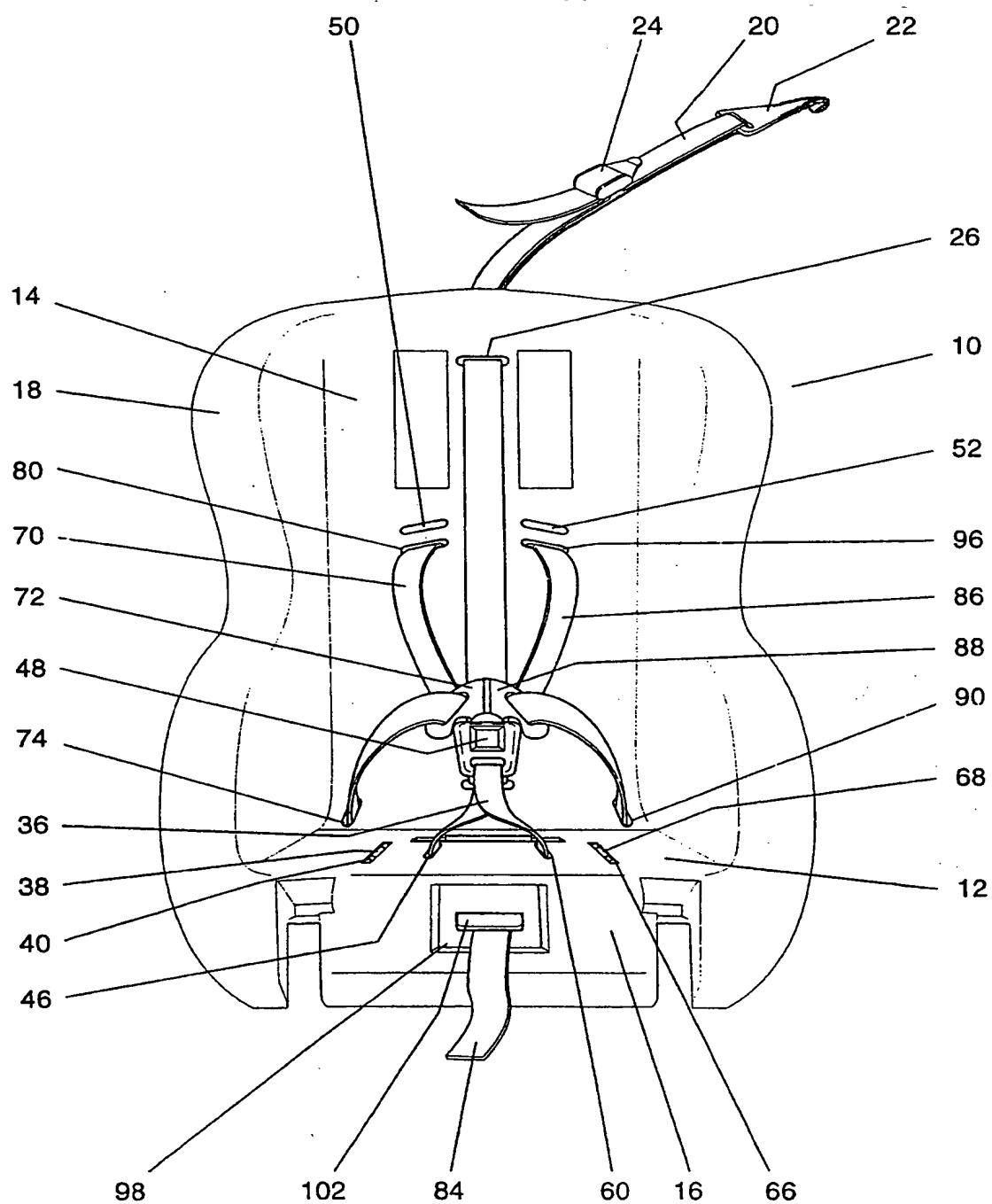


Figure 3

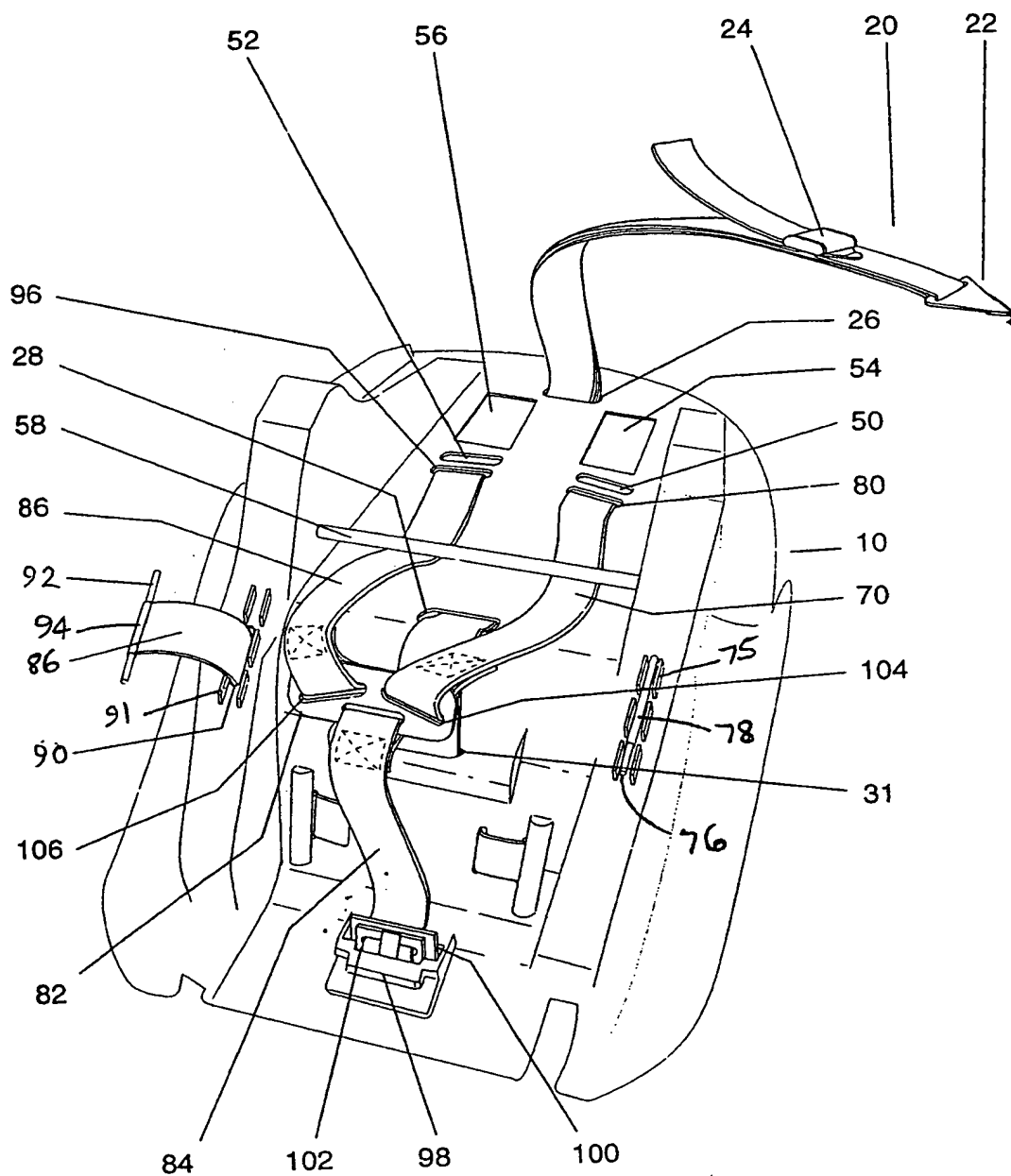


Figure 4

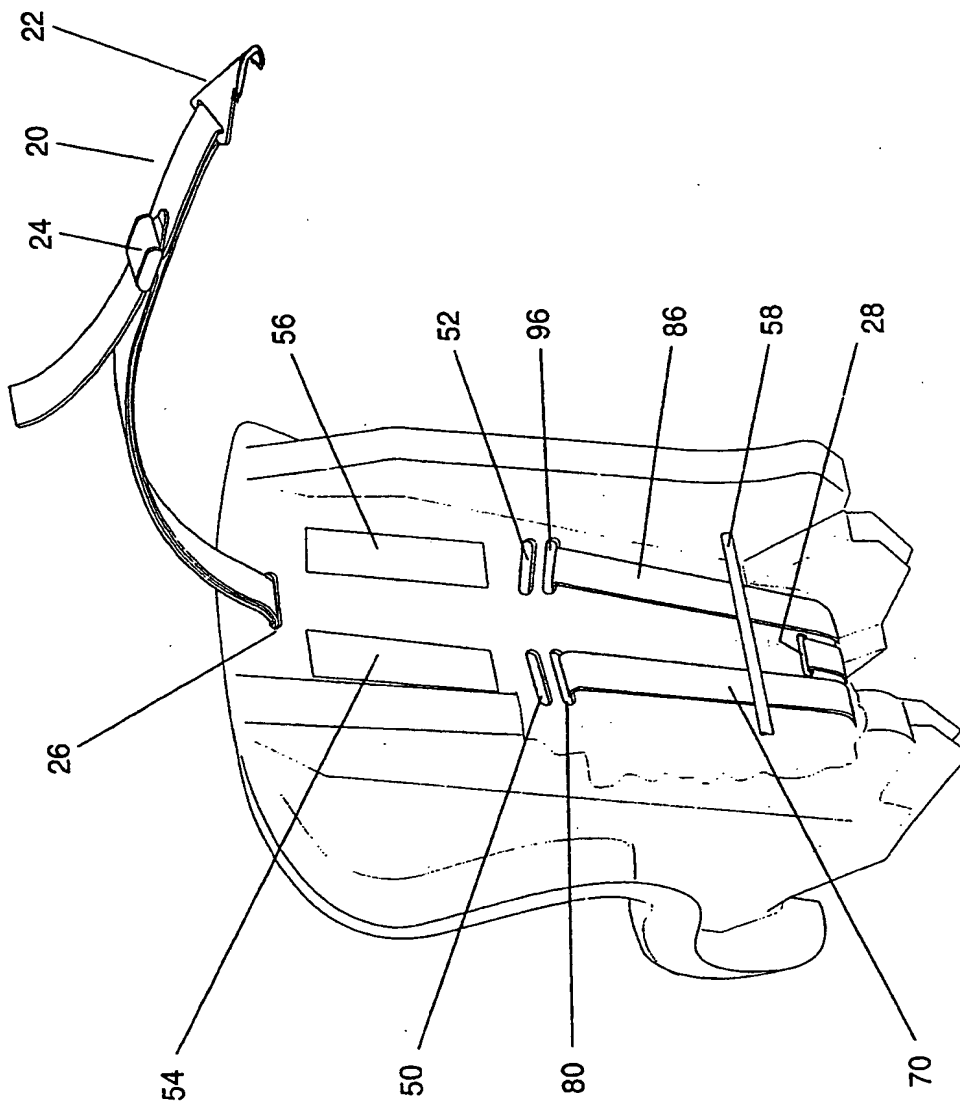


Figure 5

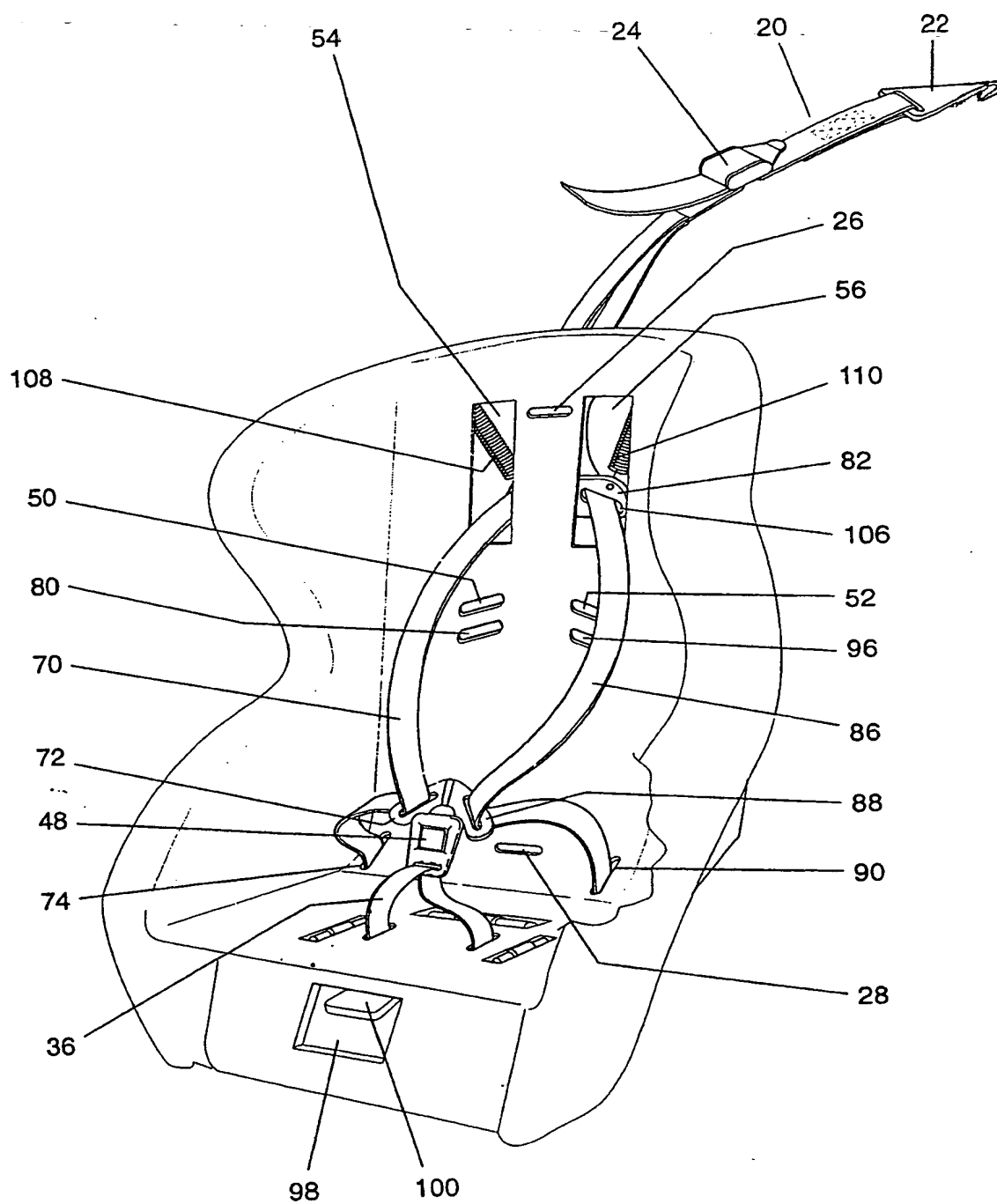


Figure 6

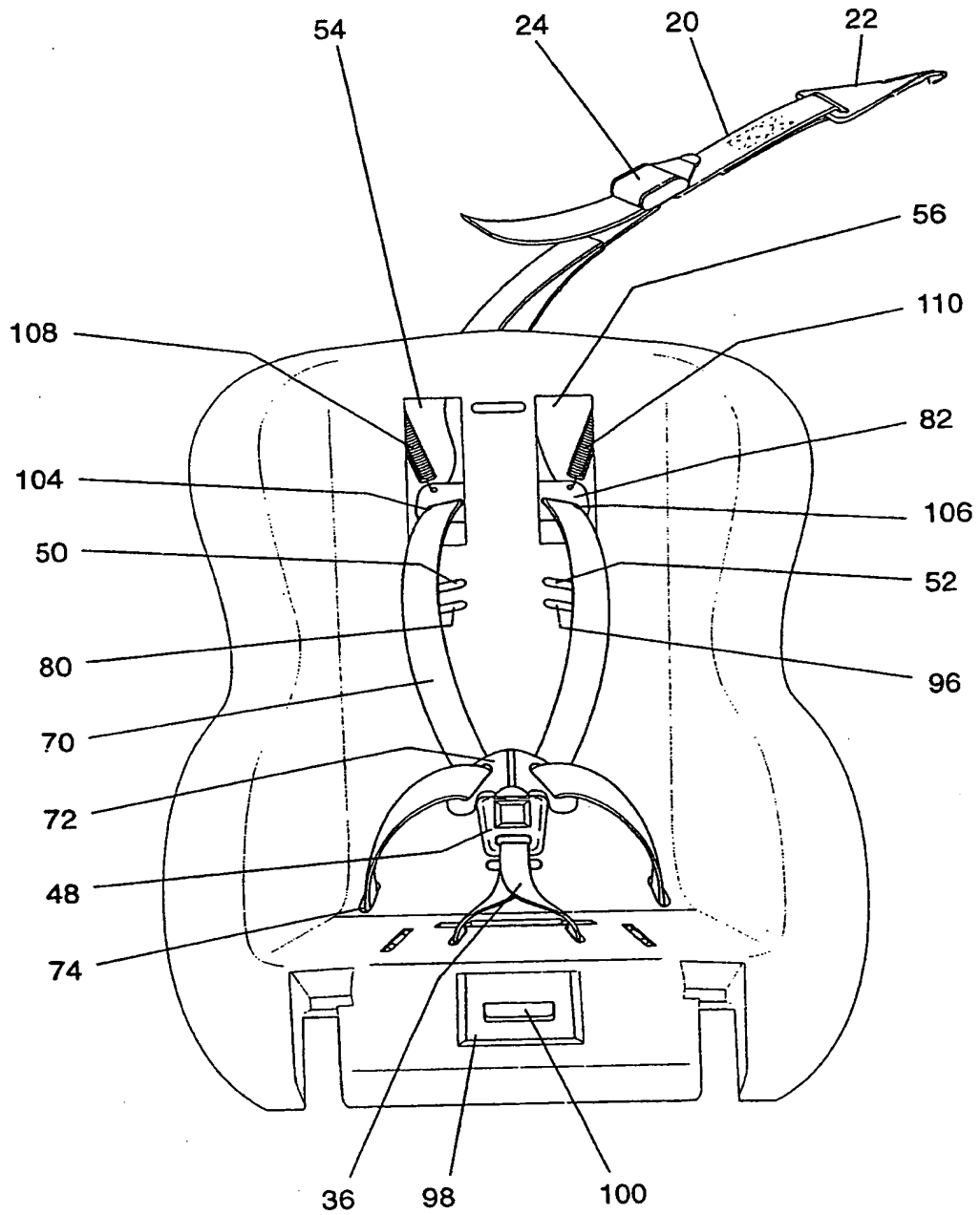
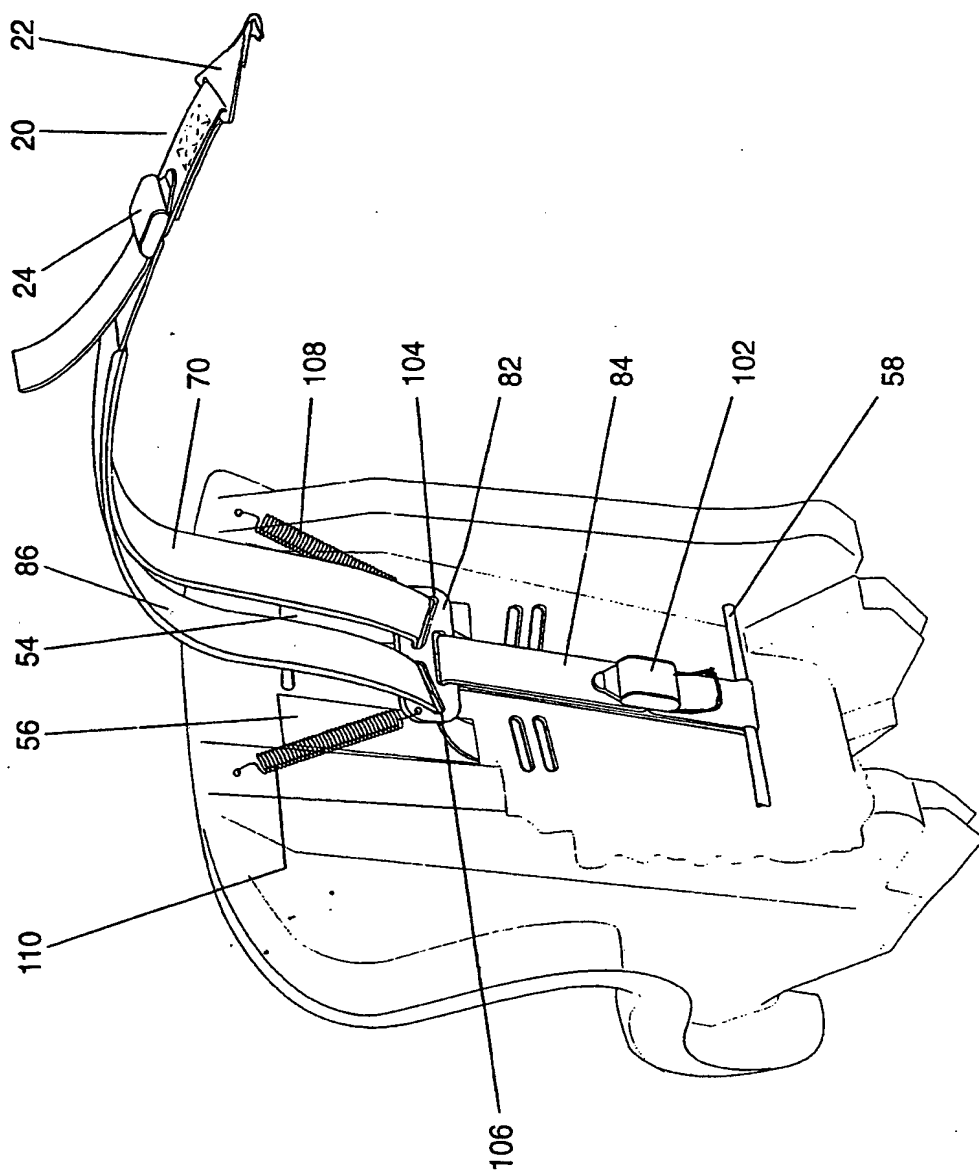


Figure 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/01361

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. ⁷ : B60N 2/28, 2/26; B60R 22/10		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B60N 2/28, 2/26; B60R 22/10		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC AS ABOVE		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: Keywords search CHILD+ AND (SEAT? OR SHELL?) AND (RESTRAIN+ OR BELT+)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 10101/97 A (IGC (AUSTRALIA) PTY LTD) 17 July 1997 Whole document, in particular, Page 7 lines 1 to page 8 line 9, & figures 1-3	1-20
X	Derwent Abstract Accession No. 98-514789/44, Class Q14 Q17, JP 10226309 A (APRICA KUZUNISHI KK) 25 August 1998	1-13
Y	Whole Abstract	14-18, 19, 20
X	AU 61977/98 A (BRITAX CHILD-CARE PRODUCTS PTY LTD) 29 October 1998	1-13
Y	Whole document	14-18, 19, 20
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 4 December 2000		Date of mailing of the international search report 6 - DEC 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer LIONEL BOPAGE Telephone No : (02) 6283 2153

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/01361

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99/37499 A (VOLVO AB) 29 July 1999	19, 20
Y	Pages 4 lines 3 to page 7 line 27, claim 2 and figure 1 & 2	14-18
	Whole document	
Y	AU 29978/92 A (FOLDAWAY INDUSTRIES LTD) 10 June 1993	14-18
	Whole document	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/01361

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-13
2. Claims 14-18
3. Claims 19, 20

As reasoned on the extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/01361

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: II

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-13 are directed to a child restraint selectively reconfigurable between a type B restraint and a type E restraint. It is considered that the selective reconfigurability comprises a first "special technical feature".
2. Claims 14-18 are directed to a child restraint having a harness assembly, the harness assembly including two hip and shoulder straps which pass through at least one elongate opening in the restraint and combine to form a tether strap. It is considered that the harness assembly with said characteristics comprises a second "special technical feature".
3. Claims 19-20 are directed to a shell for a child restraint including a base and a back, the back having at least one upper vertically elongate openings, for the passage there through of shoulder straps of a harness assembly when the restraint is in a type E configuration. It is considered that the back of the shell with said characteristics comprises a third "special technical feature".

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/01361

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
AU	10101/97	NZ	314050				
WO	9937499	SE	9800192				

END OF ANNEX